

UNCLASSIFIED

FY 2000 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET

DATE: February 1999

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0603724N
PROGRAM ELEMENT TITLE: Navy Energy Program (ADV)

(U) COST: (Dollars in Thousands)

PROJECT NUMBER & TITLE	FY 1998 ACTUAL	FY 1999 ESTIMATE	FY 2000 ESTIMATE	FY 2001 ESTIMATE	FY 2002 ESTIMATE	FY 2003 ESTIMATE	FY 2004 ESTIMATE	FY 2005 ESTIMATE	TO COMPLETE	TOTAL PROGRAM
R0829	Energy Conservation (ADV)									
	2,110	2,495	2,799	2,761	2,898	2,966	3,048	3,124	CONT.	CONT.
R0838	Mobility Fuels (ADV)									
	1,895	2,076	2,185	2,201	2,248	2,301	2,359	2,419	CONT.	CONT.
TOTAL	4,005	4,571	4,984	4,962	5,146	5,267	5,407	5,543	CONT.	CONT.

A. (U) MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: This program supports projects to evaluate, adapt, and demonstrate energy related technologies for ship and aircraft operations to: (a) increase fuel-related weapons systems capabilities such as range and time on station; (b) conserve energy and reduce energy costs; (c) reduce dependence on petroleum fuels and apply energy technologies that improve environmental compliance; (d) relax unnecessarily restrictive fuel specification requirements to reduce cost and increase availability worldwide; (e) provide guidance to fleet operators for the safe use of commercial grade or off-specification fuels when military specification fuels are unavailable or in short supply; and (f) make needed periodic changes to fuel specifications to ensure fuel quality and avoid fleet operating problems. Through 1995, the Navy Energy Research & Development Program, of which this program element is a part, had produced energy cost avoidance estimated at \$130M per year (compared to 1985 consumption rates). As currently funded, additional savings of \$25M per year are projected to be achieved by FY 2000.

(U) This program, and the companion PE 0604710N, Navy Energy Program (ENG), support the achievement of legislated, White House, Department of Defense and Navy Energy Management Goals; and also the Office of the Secretary of Defense, the Secretary of the Navy and the Chief of Naval Operations direction to make up-front investment in technologies that reduce future cost of operation and ownership of the fleet and supporting infrastructure.

(U) Joint Mission Areas/Warfare Areas (JMA): This program directly supports the following JMA's: Littoral Warfare, Sea and Air Superiority, Strategic Mobility, Readiness and Support and Infrastructure.

UNCLASSIFIED

R -1 Line Item 62

Budget Item Justification
(Exhibit R-2, page 1 of 10)

UNCLASSIFIED

FY 2000 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET

DATE: February 1999

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PROGRAM ELEMENT: 0603724N

PROGRAM ELEMENT TITLE: Navy Energy Program (ADV)

(U) JUSTIFICATION FOR BUDGET ACTIVITY: This program is funded under DEMONSTRATION & VALIDATION because it develops and integrates hardware for experimental tests related to specific ship or aircraft applications.

U) PROGRAM CHANGE SUMMARY FOR TOTAL PE:

	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>
(U) FY 1999 President's Budget:	4,037	4,592	4,896
(U) Appropriated Value:	0	4,522	-
(U) Adjustments from FY 1999 PRESBUDG:	-32	-21	+88
(U) FY 2000 President's Submission	4,005	4,571	4,984

(U) CHANGE SUMMARY EXPLANATION:

(U) Funding: FY 1998 decrease reflects a Small Business Innovation Research (SBIR) adjustment (-22) and Actual Execution Update (-10). The FY 1999 reduction reflects Revised Economic Assumption (-11) and CIVPERS (-10). The FY 2000 increase reflects full institutional funding of MRTFB (-18), NWCF adjustment (+165), CIVPERS (+29), Non Pay Inflation (-78) and Working Capital (-10).

(U) Schedule: Not applicable.

(U) Technical: Not applicable.

UNCLASSIFIED

R -1 Line Item 62

Budget Item Justification
(Exhibit R-2, page 2 of 10)

UNCLASSIFIED

FY 2000 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET

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BUDGET ACTIVITY: 4

PROGRAM ELEMENT: 0603724N

PROJECT:

R0829

PROGRAM ELEMENT TITLE: Navy Energy Program (ADV)

PROJECT TITLE:

Energy Conservation

(U) COST: (Dollars in Thousands)

PROJECT NUMBER & TITLE	FY 1998 ACTUAL	FY 1999 ESTIMATE	FY 2000 ESTIMATE	FY 2001 ESTIMATE	FY 2002 ESTIMATE	FY 2003 ESTIMATE	FY 2004 ESTIMATE	FY 2005 ESTIMATE	TO COMPLETE	TOTAL PROGRAM
R0829	Energy Conservation 2,110	2,495	2,799	2,761	2,898	2,966	3,048	3,124	CONT.	CONT.

A. (U) MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: This project improves the energy efficiency of Navy ships and aircraft, and thereby contributes to reduced operating costs and improved fleet sustainability and performance. Major efforts include work to increase the efficiency of aircraft engines; and develop improved hull drag reducing technologies and more efficient energy conversion systems for ships.

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1998 ACCOMPLISHMENTS:

- (U) (\$822) Aircraft: Completed altitude tests of advanced Performance Seeking Control (PSC) system on F414 test engine. Began program planning for flight worthy F414 PSC system for in-depth simulator and eventual flight testing (joint with General Electric (GE)). Initiated detailed design (joint with GE) of advanced High Pressure Turbine (HPT) to meet F414 growth requirements. Technology for F414B insertion (e.g. this HPT) must be designed and made in time for a GE-23a technology demonstrator engine assembly and operation in FY 2003 (Navy, Air Force, GE and the F414 program are developing engine components in a cooperative effort).
- ((U) (\$1,288) Ships: Analytically screened bow bulb and stern/propeller hydrodynamic enhancements for a TAO-187 class oiler to demonstrate reduced powering requirements. Model tested stern flap, and combined stern wedge/flap retrofit for early Guided Missile Destroyer (DDG)-51's (28 ships). Continued screening tests of advanced anti-fouling (AF) materials/coating systems (expanded testing of ablative and self-polishing copper/cobiocide paints). Supported design of hydro-fluorocarbon (HFC) 134a air conditioning plants for new construction. Supported compressor design for new 125 ton HFC-236fa plant in support of R114 replacement program. All new forward fit and retrofit compressors will incorporate Energy program developed variable geometry diffuser technology. Evaluated

UNCLASSIFIED

R -1 Line Item 62

Budget Item Justification
(Exhibit R-2, page 3 of 10)

UNCLASSIFIED

FY 2000 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET

DATE: February 1999

BUDGET ACTIVITY: 4

PROGRAM ELEMENT: 0603724N

PROJECT:

R0829

PROGRAM ELEMENT TITLE: Navy Energy Program (ADV)

PROJECT TITLE:

Energy Conservation

high efficiency, low emission power generation concept.

2. (U) FY 1999 PLAN:

- (U) (\$916) Aircraft: Conduct simulator testing of developmental PSC system to ensure flight worthiness. Participate in conceptual design of advanced fan for F414 engine to ensure efficiency gains. Continue cooperative effort with GE to design a prototype advanced HPT to meet F414 growth requirements. Evaluate F404 variant technologies to identify cost effective, fuel efficient, retrofit candidates for the F404-400.
- (U) (\$1,558) Ships: Model test bow bulb and stern/propeller hydrodynamic enhancements for TAO-187 class to demonstrate reduced powering requirements. Complete detailed design and drawings for DDG-51 retrofit stern flap or wedge/flap (first 28 ships). Conduct model tests of simple hydrodynamic mods for additional ships. Continue laboratory to bilge-keel panel tests of emerging AF coatings, self-polishing reduced copper/cobiocide paints in particular.
- (U) (\$21) Portion of extramural program reserved for Small Business Innovation Research assessment in accordance with 15 USC 638.

3. (U) FY 2000 PLAN:

- (U) (\$1,050) Aircraft: Flight test PSC advanced engine control logic on F/A-18E/F. Continue participation in GE-23a demonstrator engine program (with GE, Navy F414, and Air Force/Navy integrated high performance turbine engine technology programs) to develop advanced components to meet F414 growth requirements: advanced fan, low- pressure turbine, advanced full authority digital engine control with PSC. Energy program participation provides incentives for these efforts and ensures that efficiency, as well as performance gains are pursued.
- (U) (\$1,749) Ships: Complete detailed design and drawings for hydrodynamic refinements for TAO-187 class. Evaluate self-polishing reduced copper/cobiocide paints for energy savings and environmental impact. Continue model tests of hydrodynamic refinements to reduce powering requirements of existing/future ships. Support design of optimized air-conditioning plants for both retrofit and forward fit. Develop unified Navy approach to the generation of ship service power from fuel cells. Evaluate on-line water-wash system for gas turbines. Optimize tool designs for hull inspection remotely operated vehicle (ROV) for fouling assessment and spot cleaning.

C. (U) OTHER PROGRAM FUNDING SUMMARY: Not applicable.

(U) RELATED RDT&E:

UNCLASSIFIED

R -1 Line Item 62

Budget Item Justification
(Exhibit R-2, page 4 of 10)

UNCLASSIFIED

FY 2000 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET

DATE: February 1999

BUDGET ACTIVITY: 4

PROGRAM ELEMENT: 0603724N

PROJECT:

R0829

PROGRAM ELEMENT TITLE: Navy Energy Program (ADV)

PROJECT TITLE:

Energy Conservation

- (U) PE 0601153N (Defense Research Sciences)
- (U) PE 0602121N (Ship, Submarine and Logistics Technology)
- (U) PE 0602122N (Aircraft Technology)
- (U) PE 0602234N (Materials, Electronics and Computer Technology)
- (U) PE 0603217N (Air Systems and Weapons Advanced Technology)
- (U) PE 0603712N (Environmental Quality and Logistics Advanced Technology)
- (U) PE 0603721N (Environmental Protection)
- (U) PE 0604710N (Navy Energy Program (ENG))

D. (U) SCHEDULE PROFILE: Not applicable.

UNCLASSIFIED

R -1 Line Item 62

Budget Item Justification
(Exhibit R-2, page 5 of 10)

UNCLASSIFIED

FY 2000 RDT&E,N PROGRAM ELEMENT/PROJECT COST BREAKDOWN

DATE: February 1999

BUDGET ACTIVITY: 4

PROGRAM ELEMENT: 0603724N

PROJECT NUMBER: R0829

PROGRAM ELEMENT TITLE: Navy Energy Program (ADV)

PROJECT TITLE: Energy Conservation

A. (U) PROJECT COST BREAKDOWN: (\$ in thousands)

Project Cost Categories	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>
a. System Development and Integration	2,110	2,495	2,795

B. (U) BUDGET ACQUISITION HISTORY AND PLANNING INFORMATION: Not applicable

R-1 Line Item 62

RDT&E,N PE/Project Cost Breakdown
(Exhibit R-3, page 6 of 10)

UNCLASSIFIED

UNCLASSIFIED

FY 2000 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET

DATE: February 1998

BUDGET ACTIVITY: 4

PROGRAM ELEMENT: 0603724N

PROGRAM ELEMENT TITLE: Navy Energy Program (ADV)

(U) COST: (Dollars in thousands)

PROJECT NUMBER & TITLE	FY 1998 ACTUAL	FY 1999 ESTIMATE	FY 2000 ESTIMATE	FY 2001 ESTIMATE	FY 2002 ESTIMATE	FY 2003 ESTIMATE	FY 2004 ESTIMATE	FY 2005 ESTIMATE	TO COMPLETE	TOTAL PROGRAM
R0838	Mobility Fuels (ADV)									
	1,895	2,076	2,185	2,201	2,248	2,301	2,359	2,419	CONT.	CONT.

R-1 Line Item 62

Budget Item Justification
(Exhibit R-2, page 7 of 10)

UNCLASSIFIED

UNCLASSIFIED

FY 2000 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET

DATE: February 1999

BUDGET ACTIVITY: 4

PROGRAM ELEMENT: 0603724N

PROJECT NUMBER: R0838

PROGRAM ELEMENT TITLE: Navy Energy Program (ADV)

PROJECT TITLE: Mobility Fuels (ADV)

A. (U) MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: This project provides data through engine and fuel system tests which relate the effects of changes in Navy fuel procurement specification properties to the performance and reliability of Naval ship and aircraft engines and fuel systems. This information is required to: (a) determine the extent to which unnecessarily restrictive specification features can be relaxed to reduce cost and increase availability worldwide; (b) provide guidance to fleet operators for the safe use of off-specification or commercial grade fuels when military specification fuels are unavailable or in short supply; and (c) make needed periodic changes to fuel specifications to ensure fuel quality and avoid fleet operating problems while accommodating evolutionary changes in the fuel supply industry. Recent problems with fuel quality have adversely affected ship and aircraft system performance and reliability and resulted in degradation of fuel in storage. The resulting readiness impacts, additional maintenance costs, and the cost of lost equipment, although difficult to quantify, are many times the cost of this project. Over the next decade, the potential for fuel quality related problems will increase because of changing industry practices required to comply with new environmental regulations. This project represents the only investment designed to maintain the Navy's ability to operate as a "smart" customer for fuels that cost over \$2B per year to procure, transport, store and consume and are essential to fleet operations.

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 1998 ACCOMPLISHMENTS:

- (U) (\$863) Ships: Completed work to determine effects of absorbed and free seawater on the lubricity of Navy ship fuels and the performance of industry approved fuel lubricity test methods. Completed analysis of quality, availability and cost data for samples of commercial distillate marine fuels collected in a worldwide survey. Initiated a study to forecast through FY 2010 trends in, (a) worldwide commercial marine distillate fuel quality and availability and (b) the fuel quality needs and tolerances of future Navy ship propulsion and fuel handling systems.
- (U) (\$1,032) Aircraft: Completed initial assessment of effect of +100 aircraft fuel thermal stability enhancement additives on shipboard fuel handling equipment. Initiated evaluation of +100 additives on T-45 engine systems. Initiated T&E of prototype fuel/water separator elements for fuels containing +100 additives.

2. (U) FY 1999 PLAN:

- (U) (\$936) Ships: Complete experimental work to determine lubricity characteristics of low sulfur Navy military specification (MILSPEC) ship diesel fuels. Initiate work to determine effects of low lubricity ship diesel fuels on

R-1 Line Item 62

Budget Item Justification
(Exhibit R-3, page 8 of 10)

UNCLASSIFIED

UNCLASSIFIED

FY 2000 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET

DATE: February 1999

BUDGET ACTIVITY: 4

PROGRAM ELEMENT: 0603724N

PROJECT NUMBER: R0838

PROGRAM ELEMENT TITLE: Navy Energy Program (ADV)

PROJECT TITLE: Mobility Fuels (ADV)

the durability of Navy gas turbine engine and high-speed diesel engine fuel handling systems. Conduct bench scale tests of the effects of red-dyed marine distillate fuels on Navy gas turbine engine hot section materials. Complete study to forecast marine distillate fuel and Navy engine characteristics through 2010. Initiate work to determine the feasibility of specifying a single fuel for use by all Naval systems (ships, aircraft, and ground equipment).

- (U) (\$6) Portion of extramural program reserved for Small Business Innovation Research assessment in accordance with 15 USC 638.
 - (U) (\$1,134) Aircraft: Complete test & evaluation (T&E) of prototype fuel/water separator elements for +100 additive containing fuels. Complete evaluation of effect of +100 additives on P-3 and C-130 engines. Initiate evaluation of effects of +100 additives on F/A-18 engine systems. Complete development of a prototype copper contamination removal system for fuels. Complete T&E of non-toxic, environmentally benign fuel system icing inhibitors.
3. (U) FY 2000 PLAN:
- (U) (\$970) Ships: Complete gas turbine engine T&E with broadened specification marine diesel fuels and determine extent to which MILSPEC limits can be relaxed. Complete gas turbine and diesel engine component tests with low lubricity MILSPEC ship diesel fuels to determine effects on durability and initiate full-scale fuel handling system tests. Initiate evaluation of lubricity enhancing additives for use with low lubricity MILSPEC ship diesel fuels. Initiate work to quantify effects of low thermal stability Navy distillate fuels on maintenance requirements for navy gas turbine and diesel engines. Complete assessment of the feasibility of specifying the use of a single fuel for all Naval Systems.
 - (U) (\$1,215)) Aircraft: Initiate shipboard evaluation of prototype fuel/water separator elements for +100 additive containing fuels. Complete evaluation of effects of +100 additives on F/A-18C/D and T-45 engine systems. Complete detailed cost benefit analysis for Naval use of +100 additives. Conduct field tests of prototype copper contamination removal system for fuels. Complete F/A-18E/F engine component tests to determine effects of copper contaminated Navy jet fuels on engine maintenance requirements.

R-1 Line Item 62

Budget Item Justification
(Exhibit R-3, page 9 of 10)

UNCLASSIFIED

UNCLASSIFIED

FY 2000 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET

DATE: February 1999

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PROGRAM ELEMENT TITLE: Navy Energy Program (ADV)

PROJECT TITLE: Mobility Fuels (ADV)

C. (U) OTHER PROGRAM FUNDING SUMMARY: Not applicable.

(U) RELATED RDT&E:

(U) PE 0601152N (In-House Independent Laboratory Research)

(U) PE 0602234N (Materials, Electronics and Computer Technology)

D. (U) SCHEDULE PROFILE: Not applicable.

A. (U) PROJECT COST BREAKDOWN: (\$ in thousands)

Project Cost Categories	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>
a. Reliability, Maintainability, and Availability	1,895	2,076	2,185

B. (U) BUDGET ACQUISITION HISTORY AND PLANNING INFORMATION: Not applicable

R-1 Line Item 62

Budget Item Justification
(Exhibit R-3, page 10 of 10)

UNCLASSIFIED